

CLAIMS

What is claimed is:

1. A communication system comprising:
 - a base station operative to generate a chirp signal according to a chirp rate selected to reduce bandwidth usage and to reduce transmission errors, the base station being operative to transmit the chirp signal, the chirp signal being substantially orthogonal to delayed versions of the transmitted chirp signal; and
 - a receiving station operative to receive an incoming signal, the incoming signal including the chirp signal.
2. The system of claim 1, the chirp signal being a relatively narrowband signal.
3. The system of claim 2, the incoming signal further comprising noise, multipath, and other signals and the receiving station removing the noise, multipath, and other signals from the incoming signal to obtain the chirp signal.
4. The system of claim 3, the base station further comprising a transmitter chirp generator to convert base station data to a digital chirp signal and a digital to analog converter to the digital chirp signal to the chirp signal.
5. The system of claim 4, the receiving station further comprising:
 - an analog to digital converter to convert the incoming signal into a received digital signal; and
 - a receiver matched filter matched according the transmitter chirp generator, to remove unwanted signals from the received digital signal utilizing the chirp rate and to demodulate the chirp signal to obtain the base station data.
6. The system of claim 1, the chirp rate being dynamically modifiable.

7. The system of claim 1, the chirp rate being dynamically modifiable according to transmission errors and bandwidth usage.
8. A communication system comprising:
 - means for creating a chirp signal such that delayed versions of the chirp signal are substantially orthogonal to the chirp signal;
 - means for transmitting the chirp signal;
 - means for receiving an incoming signal comprising the chirp signal; and
 - means for removing unwanted signals from the incoming signal to obtain the chirp signal.
9. A transmitter chirp generator system comprising:
 - a chirp rate determiner operative to receive input data having at least one input signal, to determine a chirp rate for the at least one input signal and to generate a composite signal for the at least one input signal; and
 - an inverse transform operative to perform an inverse transform on the composite signal to generate a digital chirp signal.
10. The system of claim 9, the chirp rate determiner further operative to receive feedback data from a receiving station, the feedback data indicating transmission errors and bandwidth usage.
11. The system of claim 10, the chirp rate determiner further operative to modify the chirp rate as a function of the feedback data.
12. The system of claim 9, the chirp rate determiner employing simulation to determine the chirp rate.
13. The system of claim 9, the chirp rate determiner being further operative to identify an assigned channel for each of the at least one input signal, the system further comprising a rate assignment component operative to store at least one assigned chirp

rate corresponding to at least one assigned channel and to provide the chirp rate corresponding to the assigned channel for each of the at least one input signal.

14. The system of claim 13, the chirp rate being further operative to determine a baud time and carrier frequency.

15. The system of claim 13, the rate assignment component being further operative to maintain a list of available chirp rates, carrier frequencies, baud times, modulations, and bandwidths.

16. A receiver matched filter system comprising:

a matched filter operative to receive an input signal and to demodulate the input signal according to a stored signal template to obtain a digital data signal, the input signal including a chirp signal, the chirp signal being relatively narrowband and substantially orthogonal to delayed versions of the chirp signal in the input signal; and

a signal template generator operative to determine the signal template and to provide the signal template to the matched filter, the signal template including signal template parameters associated with the chirp signal.

17. The system of claim 16, the signal template parameters comprising a chirp rate, a modulation type, a carrier frequency and a baud time, the system further comprising:

a controller operative to detect transmission errors in the digital data signal and to modify the chirp rate, the modulation type, the baud time, and the carrier frequency based on the transmission errors.

18. The system of claim 17, the controller being further operative to track bandwidth usage and to modify at least one of the chirp rate, the modulation type, the baud time, and the carrier frequency based on the bandwidth usage.

19. The system of claim 18, the controller being further operative to generate feedback data based on the transmission errors and the bandwidth usage and to provide the feedback data to a base station.

20. A transceiver device comprising:

a transmitter chirp filter comprising:

a chirp rate determiner operative to determine a first chirp rate; and

a signal converter operative to convert an input signal to a first chirp signal according to the first chirp rate and a first carrier frequency; and

a receiver chirp filter comprising:

a receive filter operative to receive an input signal and to demodulate the input signal according to a second carrier frequency and a second chirp rate to obtain an analog signal, the input signal including a second chirp signal, the second chirp signal being relatively narrowband and substantially orthogonal to delayed versions of the second chirp signal; and

a chirp rate component operative to determine the second chirp rate and provide the second chirp rate to the receive filter.

21. The transceiver device of claim 20, the first chirp rate and the first chirp signal being substantially equal to the second chirp rate and the second chirp signal.

22. The transceiver device of claim 20, the first chirp rate and the second chirp rate selected to reduce transmission errors and bandwidth usage.

23. A method of operating a communications system comprising:
- determining at least one of a chirp rate, baud time, carrier frequency, and modulation;
 - generating a digital chirp signal according to the at least one of chirp rate, baud time, carrier frequency, and modulation; and
 - transmitting the digital chirp signal, the transmitted chirp signal being substantially orthogonal to delayed versions of the transmitted chirp signal.
24. The method of claim 23, wherein determining the chirp rate comprises:
- selecting transmission parameters based on a desired implementation, the transmission parameters including the carrier frequency, sampling rate, available bandwidth, minimum path delay, and baud rate;
 - selecting an estimated chirp rate based on the transmission parameters;
 - simulating transmission of a simulated chirp signal based on the transmission parameters to obtain a simulation result;
 - on the simulation result being acceptable, providing the estimated chirp rate as the chirp rate; and
 - on the simulation result being unacceptable, modifying the estimated chirp rate.
25. The method of claim 24, further comprising converting the digital chirp signal to an analog chirp signal and transmitting the analog chirp signal.
26. The method of claim 25, further comprising:
- receiving an incoming signal, the incoming signal including the digital chirp signal;
 - removing noise from the incoming signal;
 - downconverting the incoming signal; and
 - performing an analog to digital conversion on the incoming signal.

27. The method of claim 26, further comprising:
removing multipath signals, noise, and unwanted signals from the incoming signal; and
demodulating the incoming signal to obtain digital data.
28. A method of simulating a chirp signal comprising:
determining transmission parameters for a desired implementation, the transmission parameters including an estimated chirp rate and a differential path delay;
generating a desired signal from the transmission parameters such that delayed versions of the desired signal are substantially orthogonal to the desired signal;
generating at least one delayed signal from the desired signal, where the at least one delayed signal is a delayed version of the desired signal; and
generating a nearly worst case delayed signal from the desired signal, where the nearly worst case delayed signal is a nearly worst case delayed version of the desired signal;
simulating transmission and reception of the desired signal, the at least one delayed signal and the nearly worst case delayed signal; and
determining acceptability of the estimated chirp rate.
29. The method of claim 28, further comprising:
on the estimated chirp rate being not acceptable, modifying the transmission parameters and re-performing the transmission simulation.
30. The method of claim 28, the transmission parameters further including carrier frequency and baud time.
31. The method of claim 28, the acceptability determined by computing a matched filter output.
32. The method of claim 28, the nearly worst case signal being generated about 180 degrees out of phase from the desired signal.